Partnership in Ukraine Ministry of Health and Academy of Medical Sciences Scientific Direction of "Aerospace Medicine"

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The scientific direction of "Aerospace Medicine" was generated in 1996 under the Ministry of Health (MOH) and the Academy of Medical Sciences (AMS) of Ukraine with the purpose:

- To link up the scientific potential of the MOH and the AMS of Ukraine for the solution of fundamental and applied problems of aviation and space medicine;
- To coordinate the partner relationships with establishments of a National Academy of Sciences, National Space Agency, Ministry of Defense of Ukraine and other departments;
- To advance international cooperation.

To realize these objectives, seven scientific commissions have been set up, which cover the following topics:

1. ***Space Ecology*** *(*closed space ecology, environmental monitoring using remote ground probing technologies, space technologies, and the environment of the earth, outer space ecology).
2. ***Space Biotechnology*** (the " virus-cell" system under zero-gravity; production of biologically active substances of enhanced activity and purity; normal and malignant cell selection; studying in yeast genome shifts (for industrial and medical utilization) under zero-gravity conditions; biodamage of industrial structures and materials).

3. ***Space Radiation Medicine*** (radiation safety of crews of space equipment or enterprises using ionizing emissions; space craft electronic circuit protection system against harmful effects of high-energy galactic emissions; health support of the aerospace technology experts; biological dosimetry).

4. ***Space Pharmacology and Toxicology*** (pharmacodynamics and activity of medicines in the space environment; medical support of space flights; toxicology of closed ecological systems).

5. ***Space Biomedicine*** (vector biological processes and gravity, experimental models of human diseases as subject of space biomedicine studies; individual development and space flight factors).

6. ***Telemedicine*** (technologies; medical education; medical science; health care; special spheres of activities).

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7. ***Aerospace Medicine*** (pilots' health; flight safety; rehabilitation in aviation medicine; injuring factors of flight and professional activity of the crewmen; human factor methods and means of research; methods, means and results of pilot examination in simulated flight; vertebroneurology in aviation medicine).

In the past five years, substantial experience has been accumulated in the realization of this objective. The MOH and AMS participate in the National Space Program of Ukraine within the direction 04 "Space biology, biotechnology and medicine". Two research projects are financed within the framework of the MOH problem commission of "Space biomedicine".

1. A study of the mechanisms of developmental disturbances of the bone and muscle tissues of the rat embryo under the simulated space flight factors.
2. A study of the mechanisms of gravity-dependent processes of de- and regeneration of peripheral nerves and synapsogenesis.

As a result of this research, the conceptual aspects of assimilation in space (biomedical problems), and a systemic approach to the study of the influence of space flight factors to living organisms, including man, were formulated. New facts on the influence of space flight factors to developing organisms, on acsone transport in the peripheral nervous system, and on the reproduction system have been obtained. These data can be used in various areas of medicine (occupational diseases, military medicine, traumatology, neurosurgery, etc.).

The main findings of this research have being presented at several scientific seminars and symposia:

- Actual problems of experimental medicine (1997, 1998, 1999)
  (http://www.srlc.nmu.kiev.ua/sec_conf.html http://www.srlc.nmu.kiev.ua/rus/th_conf_r.htm).
- Symposium on Problems of Space Biomedicine (2000)
  (http://www.srlc.nmu.kiev.ua/spbiomed/symposium/titul_eng.htm).
- Scientific seminar on « Space biomedicine » (1995, 1996, 1998, 1999, 2000)
  (http://www.srlc.nmu.kiev.ua/spbiomed/seminar_history.htm
  http://www.srlc.nmu.kiev.ua/spbiomed/seminar.htm).
- Ukrainian Space - Club (1998, 1999).
  (http://www.srlc.nmu.kiev.ua/spbiomed/spaceclub_history.htm
  http://www.srlc.nmu.kiev.ua/spbiomed/spaceclub.htm).

Telemedicine is also rapidly developing. In 1996 – 1998, the concept of partnership in telemedicine was jointly developed with experts of the National Space Agency of Ukraine (NSAU), NASA (USA), the National Medical University and the Institute of Military Medicine of the Ukraine Armed Forces. This

project includes the following topics: technologies, medical education, medical science, public health service, special spheres of activities (space, ecological, military telemedicine, disaster medicine).

The Scientific Research Laboratory Center of the National Medical University established, in 1997, a center for "Telepathologist", which includes leading oncologists from Ukraine. In 1998, a partnership has been set up between this Center and the Department of Telemedicine of the Armed Forces Institute of Pathology of the USA (AFIP).

Presently, the commission on "Telemedicine" works in tight partnership with the Ukrainian Association of Computer Medicine (UACM). This association was established in Kharkov in 1992. In 1993 it has become a national Member of the International Association of Medical Computer Informatics (• • • •). In 1994, at the IVth European Congress on Medical Computer Science, UACM became a national Member of the European Federation of Medical Informatics. Now UACM integrates 75 research institutes, universities, scientific societies, medical establishments and firms. Experts in the field of medical computer science, medicine and radio electronics from Russia, Belarus, USA, Canada, Japan, Great Britain, France, Poland, Turkey have been included in the Scientific Council of UACM (http: // www.uacm.cit-ua.net). The main results from this collaboration were discussed on a Symposium on Telemedicine (Kiev, 2000; http://www.srlc.nmu.kiev.ua/telemed/index.htm). At the Symposium on Problems of Space Biomedicine, a telebrigde between Ukraine and Russia was for the first time discussed. Experts of the Scientific Research Laboratory Center of the National Medical University, the State Scientific Center of the Institute of Biomedical Problems (Moscow, Russia) and the foundation of "Telemedicine" (Russia) have participated in this project.

The "Aerospace medicine" commission organized, in cooperation with the Institute of Military Medicine (Ukraine) a first International Symposium on Aviation and Space Medicine (Ukraine - Russia - AGARD/NATO), where the following topics were discussed:

- Pilots' health;
- Flight safety;
- Rehabilitation in aviation medicine;
- Injuring flight factors and professional activity of crew members;
- Human factor: methods and means of research;
- Methods, means and results of pilot study in imitative flight;
- Vertebroneurology in aviation medicine;
- Biological experiments in aerospace medicine;
- Closed space ecology;
- Biodamage of industrial structures and materials;

- Medical and preventive aspects of health-support of the aerospace technology experts;
- Biological dosimetry;
- Toxicology of the closed ecology system;
- Telemedicine.

This Symposium prepared the ground for the development of a long-term partnership between Ukraine and the NATO countries in the field of military medicine and has created the necessary preconditions for the subsequent NATO Human Factors and Medicine Panel activities in Kiev. As a consequence, all conditions are favorable for the further development of partnership interactions between the Ukrainian and foreign experts in the broad field of aviation, space and military medicine.